

Answer on Question #69193- Physics / Other

A particle moves along the curve $y = Ax^3$ such that $x = Bt$, and A and B are constant. Express the position vector of the particle in the form $\mathbf{r}(t) = x\mathbf{i} + y\mathbf{j}$. Calculate the velocity of the particle along this path at any instant.

Solution:

$$x(t) = Bt,$$

$$y(t) = Ax^3 = AB^3t^3.$$

The position vector of the particle

$$\mathbf{r}(t) = x(t)\mathbf{i} + y(t)\mathbf{j} = Bt\mathbf{i} + AB^3t^3\mathbf{j}.$$

The velocity of the particle

$$\mathbf{v}(t) = \mathbf{r}'(t) = x'(t)\mathbf{i} + y'(t)\mathbf{j} = B\mathbf{i} + 3AB^3t^2\mathbf{j}.$$

Answer: $\mathbf{v}(t) = B\mathbf{i} + 3AB^3t^2\mathbf{j}$

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